REMARKS

The Pending Claims

Claims 1-27 are currently pending. The pending claims are directed to a system for polishing a substrate comprising a liquid carrier, ammonium oxalate, a hydroxy coupling agent, and a polishing pad and/or an abrasive, wherein the system does not comprise an oxidizing agent. The pending claims are also directed to a method of polishing a substrate using the same.

Discussion of the Claim Amendments

Claim 1 has been amended to recite a system for polishing a substrate, wherein the system does not comprise an oxidizing agent. Support for this amendment can be found in the instant specification (e.g., at paragraph [0023], lines 5-6). No new matter has been added by way of this amendment.

Summary of the Office Action

Claims 1-8, 13, 15, 16-18, 20, 22-24, and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishimoto et al. (i.e., U.S. Patent 6,582,761) (hereinafter the Nishimoto '761 patent) in view of Sun et al. (i.e., U.S. Patent 6,159,076) (hereinafter the Sun '076 patent). Claims 19, 21, 25, and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Nishimoto '761 patent in view of the Sun '076 patent and further in view of Ni (i.e., U.S. Patent 6,503,766) (hereinafter the Ni '766 patent). In addition, the Office Action indicates that claims 9-12 and 14 would be allowable but for being dependent on a rejected base claim.

Discussion of the Obviousness Rejections

The final Office Action alleges that the subject matter of the pending claims is obvious in view of the combined disclosures of the Nishimoto '761, Sun '076, and Ni '766 patents. In particular, the Office Action relies on the Nishimoto '761 patent for its disclosure of an aqueous dispersion for polishing comprising ion-exchanged water, ammonium persulfate, silane coupling agent, polishing pad, and metal abrasive, but recognizes that the Nishimoto '761 patent does not specifically disclose using ammonium oxalate in the aqueous dispersion. The Office Action relies on the Sun '076 patent for its recitation of a method for polishing metal using an abrasive solution comprising ammonium oxalate as a chelating agent. The Office Action alleges that one skilled in the art would have found it obvious to modifiy Nishimoto's polishing solution to incorporate ammonium oxalate because the Sun

'076 patent discloses that ammonium oxalate provides an improvement in material removal rate by providing a ligand that binds strongly with metal (nickel) and is a metal (nickel) chelator. The Ni '766 patent allegedly teaches the optimization of a polishing rate by adjusting a polishing parameter such as polishing agent flow. The Office Action alleges that it would have been obvious for one of ordinary skill in the art to modify the polishing composition obtained from the combination of the Nishimoto '761 patent and the Sun '076 patent to obtain the removal rate selectivity ratios recited in some of the pending claims.

To establish a prima facie case of obviousness, three basic criteria must be met: (a) there must be some suggestion or motivation to modify the reference or to combine reference teachings, (b) the prior art references must teach or suggest all the claim limitations, and (c) there must be a reasonable expectation of success. See, e.g., M.P.E.P. § 2142. The Office Action, however, fails to properly identify a suggestion or motivation that would have caused one of ordinary skill in the art, at the time of invention, to combine the cited references in such a way as to arrive at the invention defined by the pending claims. Indeed, the combination of the cited references by one of ordinary skill in the art would not result in the subject matter of the pending claims.

The present invention, as defined by the pending claims as amended, is directed to a polishing system, and corresponding method of using the polishing system, comprising (a) a liquid carrier, (b) ammonium oxalate, (c) a hydroxy coupling agent, and (d) a polishing pad and/or an abrasive, wherein the system does not comprise an oxidizing agent.

The Nishimoto '761 patent is directed to a method for producing a composited particle. In its discussion of chemical-mechanical planarization of a metal-containing surface with the composited particles of the invention, the Nishimoto '761 patent states that the polishing rate can be improved significantly by compounding an oxidizer in an aqueous dispersion. See column 17, lines 32-38. Indeed, an oxidizer is utilized in each of the examples demonstrating the polishing of a metal film set forth in the Nishimoto '761 patent (see Examples 5-8 and 9-12). The Nishimoto '761 patent also discloses that substrates comprising dielectric layers can be polished with an aqueous dispersion that does not contain an oxidizing agent. Thus, the ordinarily skilled artisan, provided with the disclosure of the Nishimoto '761 patent, would be led to two different polishing compositions, one suitable for the polishing of metal surfaces that comprises an oxidizing agent, and one suitable for the polishing of dielectric surfaces that does not comprise an oxidizing agent. Neither polishing composition comprises ammonium oxalate, as required by the pending claims.

The Sun '076 patent does not cure the deficiencies of the Nishimoto '761 patent. The Sun '076 patent teaches a slurry for polishing a surface comprising a liquid phase, an abrasive

comprising silica, and a species comprising a ligand of an element contained in the surface, which ligand forms a bond with an ion or atom of the element to remove the element from the surface. The ligand is selected from the group consisting of oxalate, malonate, succinate, maleate, and phthalate. Further, the Sun '761 patent teaches that it is desirable to add an electron acceptor (e.g., hydrogen peroxide) to slurries disclosed therein. In particular, the Sun '761 patent discusses the role of ammonium oxalate in polishing slurries with reference to a series of reactions that begin with the oxidation of nickel metal to nickel ions by action of the election acceptor, which nickel ions then bond with one or more ligands (e.g., oxalate). The role of the election acceptor (e.g., hydrogen peroxide), therefore, is critical to the functioning of the ligand (e.g., oxalate) (see, e.g., the Sun '761 patent at col. 6, lines 31-36). Accordingly, the Sun '076 patent teaches the use of an oxalate in conjunction with the use of an oxidizing agent in the polishing of a metal-containing surface.

Similarly, the Ni '766 patent does not cure the deficiencies of the Nishimoto '761 and the Sun '076 patents. The Ni '766 patent relates to a method and system for detecting an exposure of a material on a semiconductor wafer during chemical-mechanical polishing. The Ni '766 patent discloses that a polishing rate can be optimized by adjusting a polishing parameter such as polishing agent flow, but does not disclose the use of ammonium oxalate in a polishing composition that does not comprise an oxidizing agent.

The Office Action fails to identify anything within the references themselves or in the knowledge generally available to those of ordinary skill in the art that would have motivated one of ordinary skill in the art to modify the aqueous dispersion of the Nishimoto '761 patent by including a ligand identified in the Sun '076 patent, selecting ammonium oxalate to be the source of the ligand, and excluding the oxidizing agents disclosed in both the Nishimoto '761 patent and the Sun '076 patent.

If the ordinarily skilled artisan were provided with the disclosures of the Nishimoto '761, Sun '076, and Ni '766 patents, the artisan would have included an oxidizing agent in the polishing composition because both the Nishimoto '761 patent and the Sun '076 patent teach the inclusion of an oxidizing agent in the polishing composition, especially when a ligand such as oxalate is present in the polishing composition. Indeed, the teaching of the Sun '076 patent points away from a polishing composition that does not comprise an oxidizing agent. As noted above, the Sun '076 patent teaches that the usefulness of the ligand (e.g., oxalate) is impaired in the absence of an election acceptor (e.g., an oxidizing agent such as hydrogen peroxide). Accordingly, the ordinarily skilled artisan would be led to believe that, in the absence of an electron acceptor (e.g., an oxidizing agent such as hydrogen peroxide), there would be little or no benefit to the inclusion of a ligand (e.g., oxalate) in the

polishing composition. The combination of the teachings of the cited references does not lead to the present invention as defined by the pending claims but rather away from the present invention.

In view of the foregoing, the cited references cannot properly be combined to support the obviousness rejections of the pending claims. As a result, the obviousness rejections should be withdrawn.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

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